Title: Review of OSHA Chemical Incident Data

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Review of OSHA Chemical Incident Data

Reported incidents from 2010-2020

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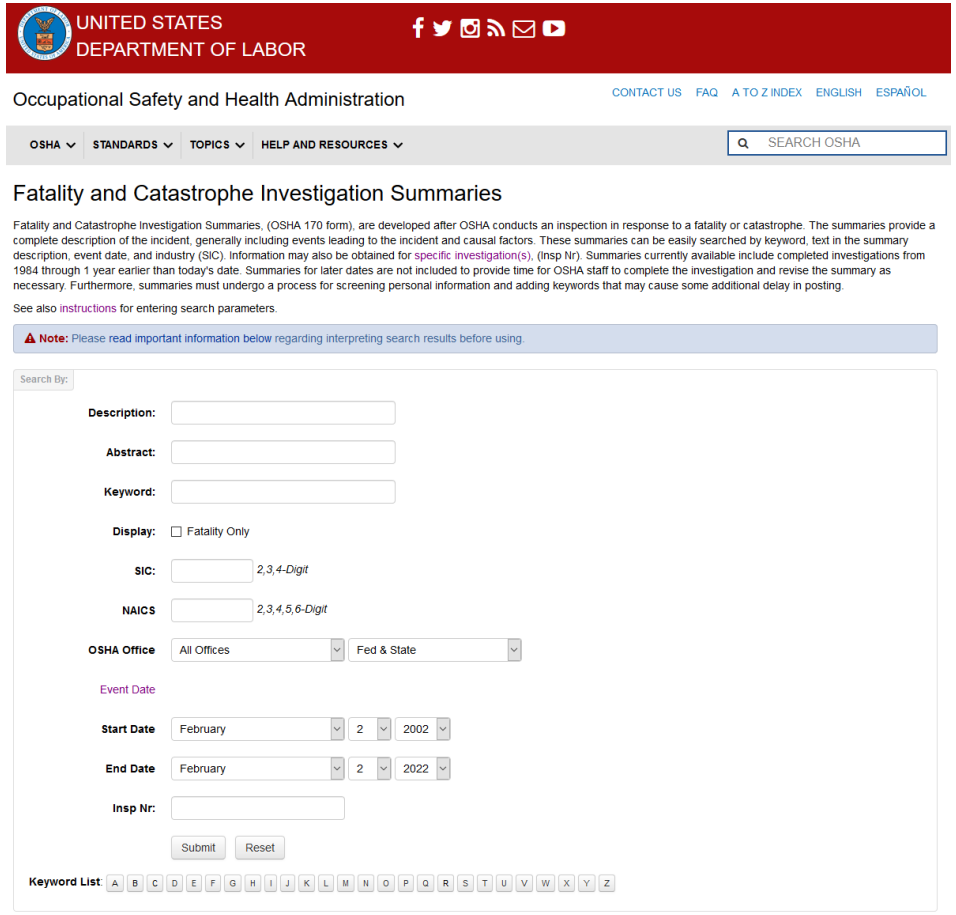
OSHA incident database (OSHA-170 form)

- The US Occupational Safety and Health Administration (OSHA) maintains a database of Fatality and Catastrophe Investigation Summaries (OSHA-170 form) filed after OSHA conducts an inspection in response to reported incidents
- Though these summaries are typically much shorter than report from the CSB, far more are filed and available
  - Allows a better understanding of frequency of chemical incidents, particularly those insufficiently catastrophic to merit CSB review

President Nixon signs the Occupational Safety and Health Act on December 29, 1970. [Public Domain]

Methodology for chemical incident review

1. Queried the OSHA incident database for keyword “Chemical” and event date range of 1-Feb-2010 to 1-Feb-2020
2. Saved data from each event to a spreadsheet: 558 events total
3. Members of LANL chemical management collaboratively viewed the incident data row-by-row to:
   - Exclude events where chemicals did not appear involved in the incident (root cause of event or source of injury)
   - Exclude duplicate records
   - Extract the chemical identity, mechanism of injury, and category of work activity from each event, as available
4. 492 events retained and categorized
5. SRS/LANL working group reviewed the events and deliberated to select those with relevance to DOE activities for inclusion in this presentation



DOE category: storage

- **OSHA summary 200626638:** Employees #1 and #2 were transferring furfurlyamine and methanol from a storage tank to the reactor to cool the stored material, since there was no way of controlling the temperature in the storage tank. During the transfer a chemical cloud formed above the building and an explosion occurred. Employees #1 and #2 suffered severe burns and succumbed to their injuries.
- **OSHA summary 202691572**: Employees #1 and #2 were in the restroom working next to the outside storage of a peroxide solution when it suddenly exploded. The cubic yard container of a peroxide solution was in direct sunlight for over a hundred days when it exploded. They employees were hospitalized for chemical vapor inhalation.

Blue Grass Chemical Agent-Destruction Pilot Plant Container Handling Building by PEO ACWA [CC BY 2.0]

Decisions made in storage design and use can create hazards that aren't immediately obvious.

DOE category: emergency management

- **OSHA summary 95451.015:** An employee was transporting two pallets of origanum oil, a corrosive food additive, to a loading dock for pick-up by DHL. The drums were observed leaking and the manager instructed all employees to leave the areas while he consulted the Emergency Response Guidebook. The police department arrived to take command and instructed the manager to guard the area to keep other employees away. The manager was positioned about 10 feet from the spill with little ventilation, with the building doors were closed due to airport security reasons. The manager and a warehouse agent were hospitalized for respiratory irritation, chest pain, and skin irritation.
- **OSHA summary 92276.015:** An employee was dispensing chemicals into 2.5 gallon containers when the hoses used to transfer chemicals fell and spilled onto the floor. The employee returned the hoses to the dispensing unit and continued to fill the 2.5-gallon containers. Later, the employee added water to clean up the spill on the floor, creating a chemical cloud. The employee was hospitalized for chemical vapor inhalation.

How we respond to spills and other emergencies can turn a release into an exposure.

Pueblo Chemical Agent-Destruction Pilot Plant Agent Processing Building by PEO ACWA [CC BY 2.0]

DOE category: disposal

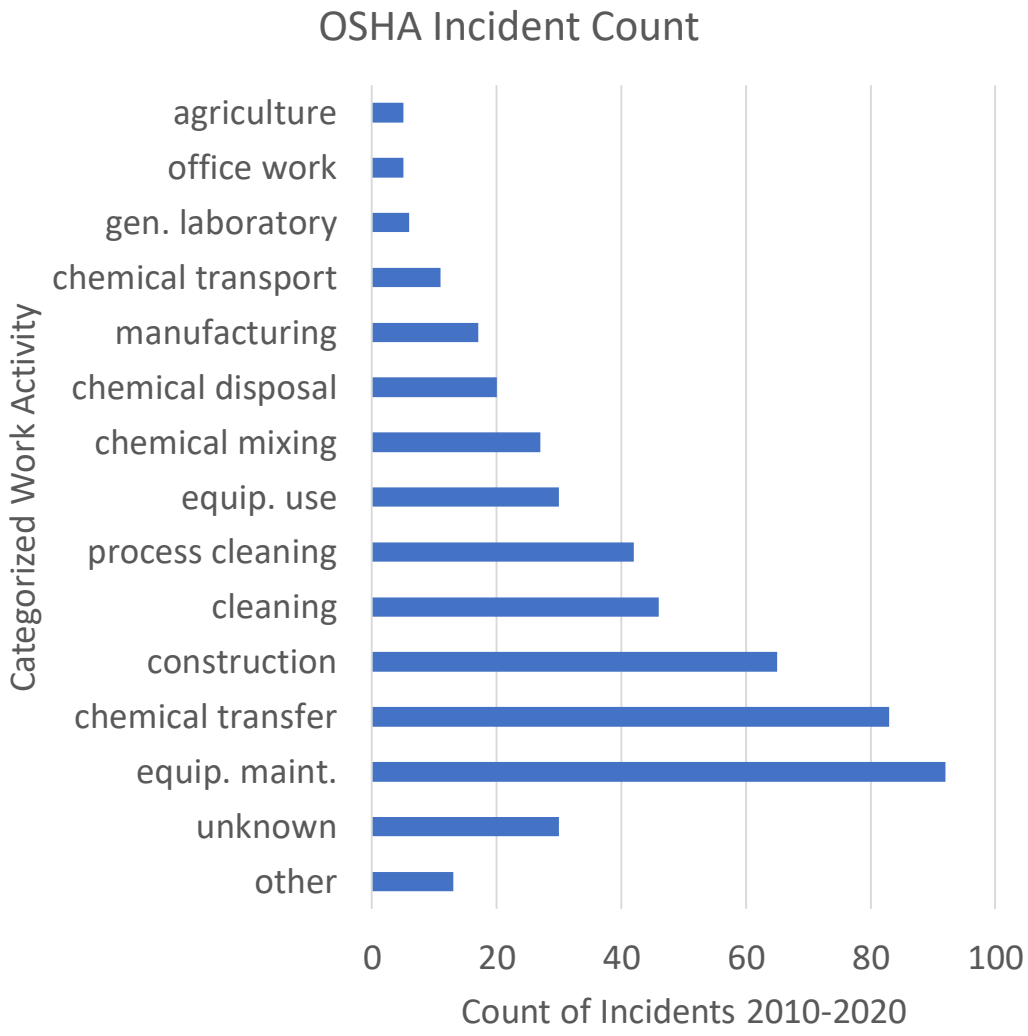
- **OSHA summary 201129715:** An employee collected flammable liquids from the research labs and brought them back to the hazardous waste processing bunker. The 20 gallons of flammable liquids comprised of multiple chemicals and formed one profiled waste stream. While examining a glass ampoule of a pyrophoric liquid, the employee dropped the ampoule, which broke on the drum funnel and self-ignited, igniting the contents of the drum. The employee was hospitalized for four weeks for 3rd and 2nd degree burns to his head, face, neck, hands, arms and legs.
- **OSHA summary 202532305:** Employees #1 and #2 were working at a chemical production facility. On instruction from the production manager, another employee poured a 5-gallon container of unneeded trigonox into a 55-gallon waste drum containing leftover methyl methacrylate and ethyl acrylic from an earlier batch. Later that evening, the chemicals in the drum reacted and over pressurized the drum, ejecting the lid which struck a steam pipe and ignited the contents of the drum. The vapors traveled into the adjoining room and ignited. Employees #1, #2, and #3 (who responded to the fire) suffered severe burns.

Blue Grass Chemical Agent-Destruction Pilot Plant Waste Handler by PEO ACWA [CC BY 2.0]

Disposal of materials can be can become unexpectedly hazardous, especially when mixing materials.

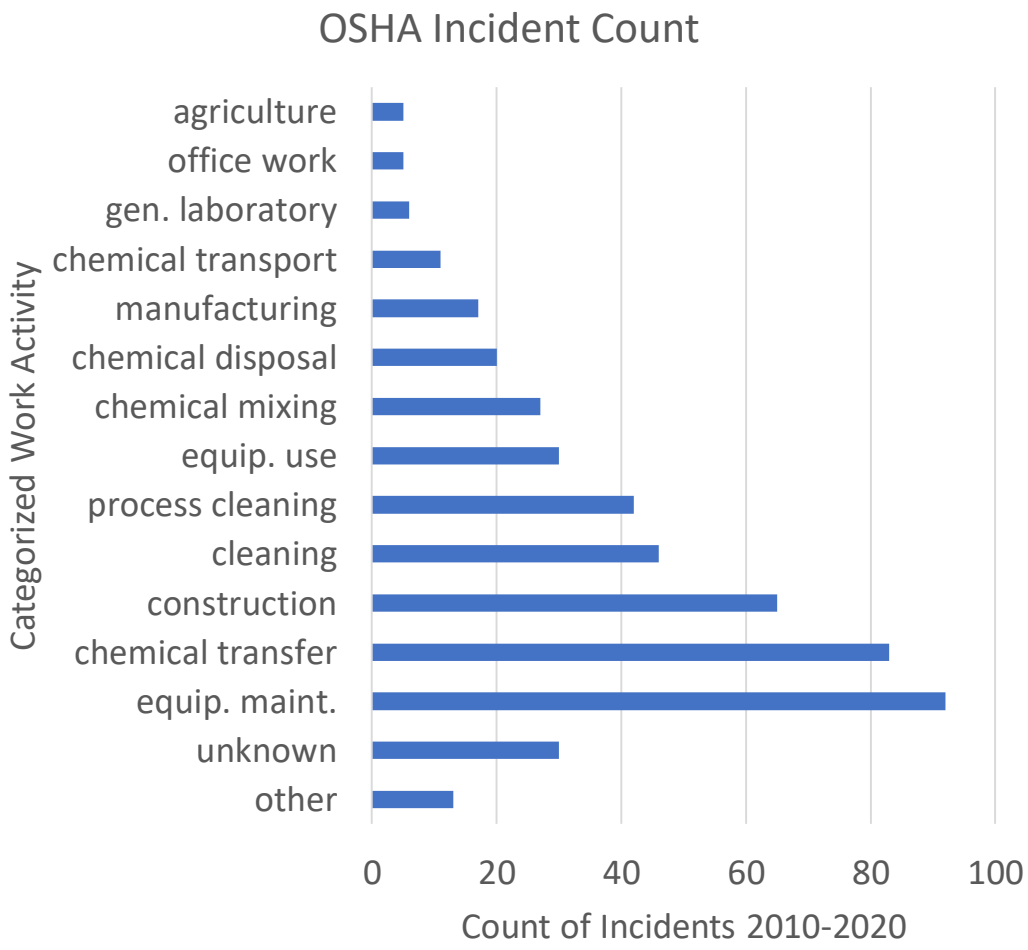
OSHA chemical incidents by work activity

- 492 chemical incidents over 10 years
- Nearly 50% of incidents fall into just 3 work activity categories:
  - Equipment maintenance (19%)
  - Chemical transfer (17%)
  - Construction/renovation (13%)
- Cleaning represents another 18% of chemical incidents



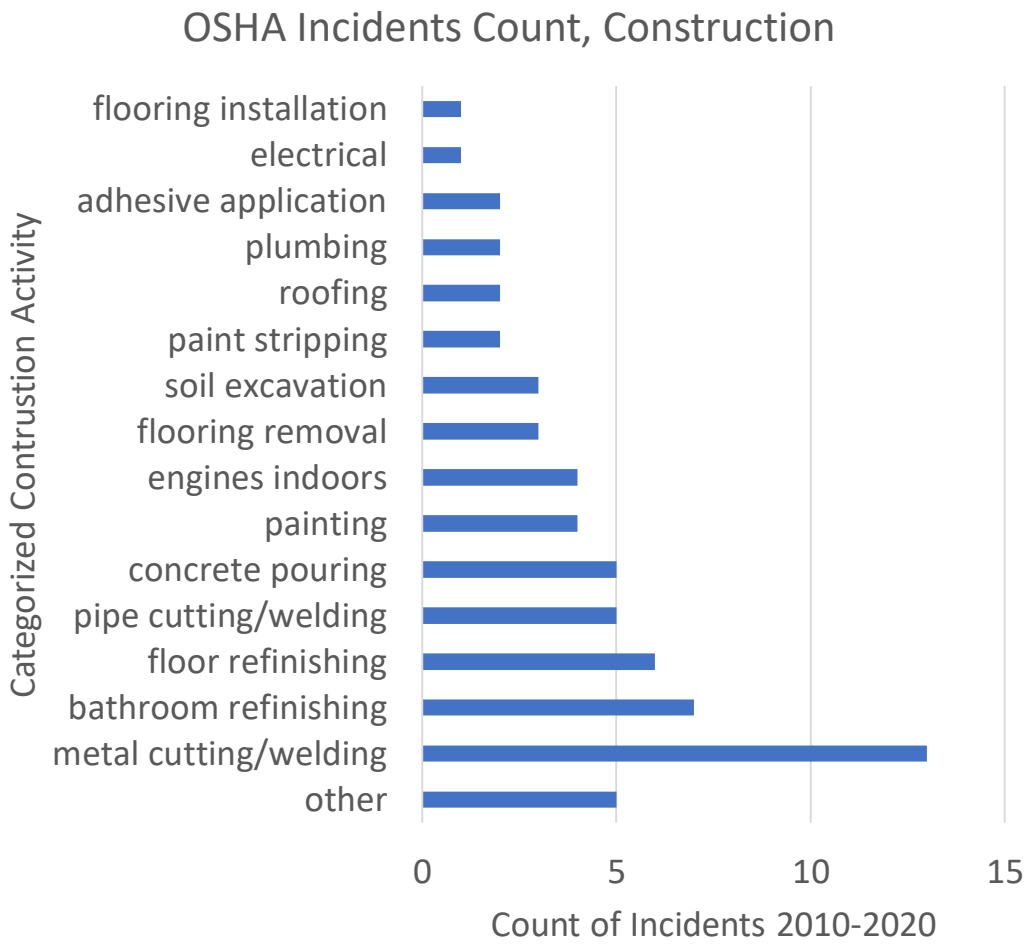
Sprays and splashes are a common mechanism of exposure and injury

- 142 of 492 event narratives involved a “spray” or “splash” of chemicals that led to injury
  - Hazard + energy → exposure
  - Equipment maintenance and chemical transfers are the most associated with sprays and splashes
  - Consider how material can be dispersed by pumps, gravity, etc.
- This is a common mechanism of injury for chemical transfer, equipment maintenance, cleaning, and other work activities



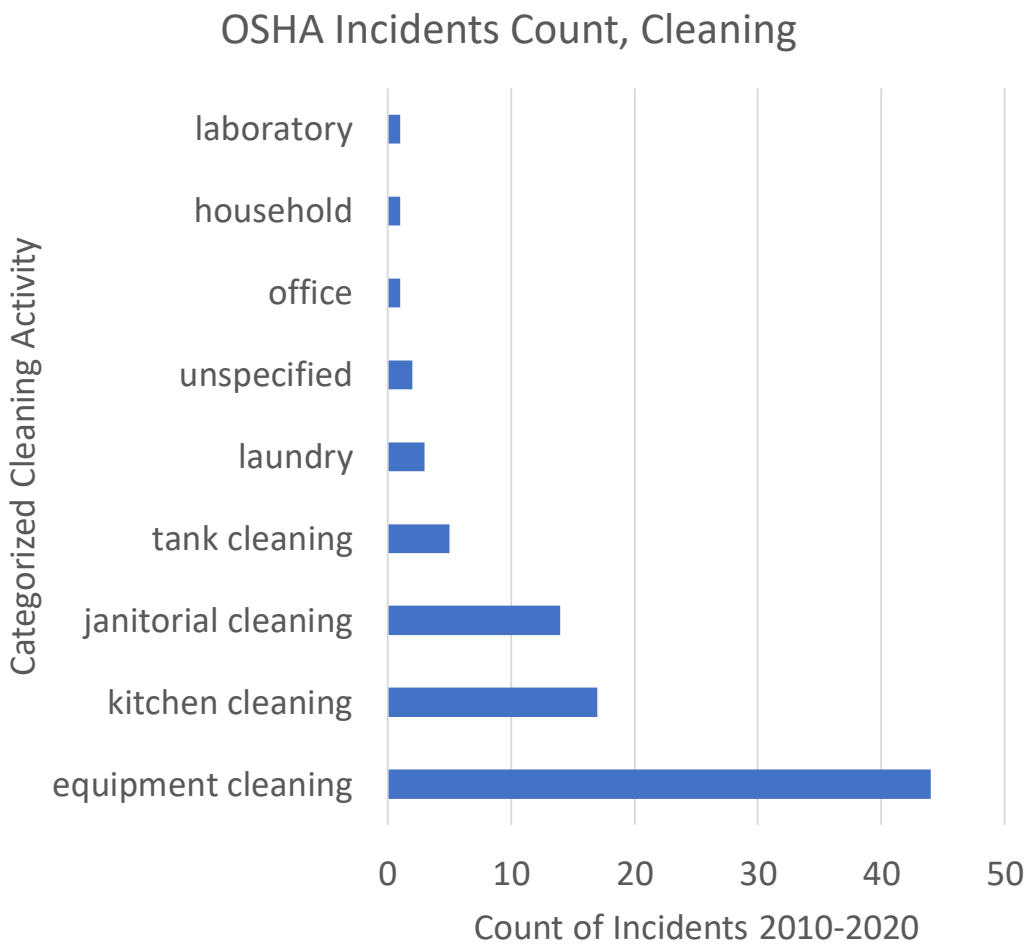
Construction activities may be under-considered for chemical risk

- 65 of 492 event narratives were classified as construction-related
  - More obvious hazards may drive focus away from chemicals
  - Casual use of solvents (e.g. dichloromethane) leads to many fatalities
  - Metal cutting/welding in combination with flammable atmospheres leads to many fatalities
  - Concrete/grout mixtures are a common cause of chemical burns



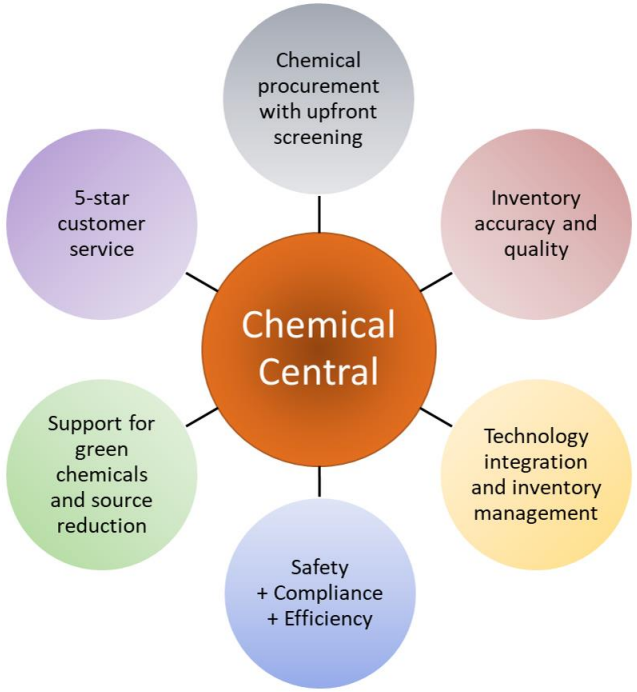
Cleaning activities may be under-considered for chemical risk

- 88 of 492 event narratives were classified as cleaning-related
  - Cleaning solutions can be highly hazardous (e.g. peracetic acid) or create secondary hazards (e.g. floor cleaner is slippery)
  - Equipment cleaning mechanism of exposure is often sprays and splashes
  - Kitchen and janitorial cleaning injuries are often related to fumes from incompatible materials or skin contact with caustics



Acknowledgements

- Pulling and curating the OSHA data was a big lift by volunteers from the LANL Chemical Central (C2) team



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